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B-2 Test Stand

The B-2 Test Stand at NASA's Stennis Space Center is big – in size and in the testing projects it undertakes. As recently modified, the stand ranks as one of the tallest structures in Mississippi. It originally was built to test Saturn rocket stages for the Apollo Program that carried humans to the Moon in the late 1960s and early 1970s. It then was modified to test – and prove flight worthy – the space shuttle Main Propulsion Test Article configuration prior to the vehicle's first flight. If that is not impressive enough, the stand now has been modified to test stages of NASA's new Space Launch System, which is being built for NASA's Artemis Program that will carry humans deeper into space than ever, to such destinations as the Moon and, ultimately, Mars. No doubt – when it comes to the B-2 Test Stand, one has to think big.

- The B-1/B-2 Test Stand is a dual-position, vertical-firing facility built in the 1960s to test Saturn rocket stages that carried humans to the Moon during the Apollo Program.

- The B-1/B-2 stand is anchored in the ground with 144 feet of steel and concrete. The 7,000 tons of steel in the stand is about as much as was needed to build the Eiffel Tower. The stand also has 86,000 cubic yards of concrete, estimated as enough to build a sidewalk from Stennis to Memphis, Tennessee.

- The B-1 (shorter) side of the stand is used for single engine testing. The B-2 (taller) side is designed for stage and main propulsion system testing.

- NASA conducted the first-ever hot-fire test on the B-2 Test Stand, a 15-second firing of the Saturn S-IC-T rocket stage, on March 3, 1967. Twelve Saturn S-IC stages were tested on the B-2 stand from April 1967 to October 1970. S-IC-4 through S-IC-12 powered Apollo 9 through 17 missions to the moon. S-IC-13 launched Skylab into orbit.

- The space shuttle Main Propulsion Test Article, consisting of an external tank, a mock orbiter structure and three main engines linked together and installed on the B-2 stand, was tested from December 1977 through January 1981.

- The RS-68-powered Delta 4 Common Booster Core was tested on the B-2 stand from November 1999 through May 2001.

- NASA spent six years preparing the B-2 Test Stand to test taller, heavier stages of NASA's new Space Launch System. The work included upgrades to every major stand system:

  - Electrical, data, mechanical and propellant piping systems were modified and enhanced to handle demands of Space Launch System testing.

- The derrick crane atop the B-2 stand was strengthened and extended 50 feet to lift the new Space Launch System core stage onto the stand.

- A 1.2 million-pound structural frame was repositioned and another 1 million pounds of steel was added to accommodate Space Launch System stages.

- The Stennis high-pressure industrial water system was replaced to increase flow capacity to 335,000 gallons, primarily used to cool super-hot engine test exhaust.

- Core stage testing will involve installing an actual flight stage and firing its four RS-25 engines simultaneously, just as will occur during an actual launch. Tests will be conducted on the core stage prior to its use on the Artemis 1 mission.

- As originally constructed, the soft core of the B-2 Test Stand was about 290 feet tall. The new steel superstructure added to facilitate testing of the Space Launch System core stage extends the structural height to 342 feet. However, the main derrick's mast atop the stand will still be the tallest element of the test stand at approximately 360 feet. By comparison, the Statue of Liberty stands 305 feet high from ground to torch.

- The main derrick crane atop the B-2 Test Stand will be used to lift the Space Launch System core stage into place for testing. The core stage will stand more than 210 feet tall with a diameter of 27.6 feet. To lift the stage, the B-2 derrick crane was extended 50 feet and the load rating was increased to 195 tons.

- Simultaneous firing of the Space Launch System's core stage's four RS-25 engines will generate 2 million pounds of thrust.

- More than 32,500 5/32-inch holes in the B-2 Test Stand flame deflector direct more than 240,000 gallons of water a minute to cool rocket engine exhaust during a hot fire test. About another 92,000 gallons of water per minute will be sprayed through 92 nozzles to provide vibro-acoustic suppression protection during Space Launch System core stage testing. This also will help to shield the stage from radiant heating and other thermal effects.

- There are well over 100 water nozzles of various sorts and sizes arrayed across the test stand that could provide a curtain of water over the length of the core stage and across the test facility to prevent damage in the event of a fire or cryogenic spill. Water also would be diverted from the flame deflector and vibro-acoustic spray ring to support these emergency operations.

- The average American household uses about 100,000 gallons of water a year. During a Space Launch System core stage test, the B-2 stand will use that amount every 18 seconds.

- The B-2 stand is serviced by the Stennis High Pressure Industrial Water Plant. The original system has been upgraded due to age and in order to increase the water flow needed for Space Launch System core stage testing. The water system now is capable of delivering 335,000 gallons per minute to the B-2 stand via 96-inch pipes. The capacity represents an increase of 25,000 gallons per minute from the original system.